

Materials Handling and Storage



Introduction

Handling and storing materials involve diverse operations such as hoisting tons of steel with a crane; driving a truck loaded with concrete blocks; carrying bags or materials manually; and stacking palletized bricks or other materials such as drums, barrels, kegs, and lumber.

The efficient handling and storing of materials are vital to industry. In addition to raw materials, these operations provide a continuous flow of parts and assemblies through the workplace and ensure that materials are available when needed. Unfortunately, the improper handling and storing of materials often result in costly injuries.

What should your employees know before moving, handling, and storing materials?

In addition to training and education, applying general safety principles—such as proper work practices, equipment, and controls—can help reduce workplace accidents involving the moving, handling, and storing of materials. Whether moving materials manually or mechanically, your employees should know and understand the potential hazards associated with the task at hand and how to control their workplaces to minimize the danger.

Because numerous injuries can result from improperly handling and storing materials, workers should also be aware of accidents that may result from the unsafe or improper handling of equipment as well as from improper work practices. In addition, workers should be able to recognize the methods for eliminating—or at least minimizing—the occurrence of such accidents. Employers and employees should examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment and take corrective action.

What are the potential hazards for workers?

Workers frequently cite the weight and bulkiness of objects that they lift as major contributing factors to their injuries. In 1999, for example, more than 420,000 workplace accidents resulted in back injuries. Bending, followed by twisting and turning, were the more commonly cited movements that caused back injuries.

Other hazards include falling objects, improperly stacked materials, and various types of equipment. You should make your employees aware of potential injuries that can occur when manually moving materials, including the following:

- Strains and sprains from lifting loads improperly or from carrying loads that are either too large or too heavy,
- Fractures and bruises caused by being struck by materials or by being caught in pinch points, and
- Cuts and bruises caused by falling materials that have been improperly stored or by incorrectly cutting ties or other securing devices.

What precautions should workers take when moving materials manually?

When moving materials manually, workers should attach handles or holders to loads. In addition, workers should always wear appropriate personal protective equipment and use proper lifting techniques. To prevent injury from oversize loads, workers should seek help in the following:

- When a load is so bulky that employees cannot properly grasp or lift it,
- When employees cannot see around or over a load, or
- When employees cannot safely handle a load.

Using the following personal protective equipment prevents needless injuries when manually moving materials:

- Hand and forearm protection, such as gloves, for loads with sharp or rough edges.
- Eye protection.
- Steel-toed safety shoes or boots.
- Metal, fiber, or plastic metatarsal guards to protect the instep area from impact or compression.

See OSHA's booklet, *Personal Protective Equipment* (OSHA 3077), for additional information.

Employees should use blocking materials to manage loads safely. Workers should also be cautious when placing blocks under a raised load to ensure that the load is not released before removing their hands from under the load. Blocking materials and timbers should be large and strong enough to support the load safely. In addition to materials with cracks, workers should not use materials with rounded corners, splintered pieces, or dry rot for blocking.

What precautions should workers take when moving materials mechanically?

Using mechanical equipment to move and store materials increases the potential for employee injuries. Workers must be aware of both manual handling safety concerns and safe equipment operating techniques. Employees should avoid overloading equipment when moving materials mechanically by letting the weight, size, and shape of the material being moved dictate the type of equipment used. All materials-handling equipment has rated capacities that determine the maximum weight the equipment can safely handle and the conditions under which it can handle that weight. Employers must ensure that the equipment-rated capacity is displayed on each piece of equipment and is not exceeded except for load testing.

Although workers may be knowledgeable about powered equipment, they should take precautions when stacking and storing material. When picking up items with a powered industrial truck, workers must do the following:

- Center the load on the forks as close to the mast as possible to minimize the potential for the truck tipping or the load falling,
- Avoid overloading a lift truck because it impairs control and causes tipping over,
- Do not place extra weight on the rear of a counterbalanced forklift to allow an overload,
- Adjust the load to the lowest position when traveling,
- Follow the truck manufacturer's operational requirements, and
- Pile and cross-tier all stacked loads correctly when possible.

What precautions must workers take to avoid storage hazards?

Stored materials must not create a hazard for employees. Employers should make workers aware of such factors as the materials' height and weight, how accessible the stored materials are to the user, and the condition of the containers where the materials are being stored when stacking and piling materials. To prevent creating hazards when storing materials, employers must do the following:

- Keep storage areas free from accumulated materials that cause tripping, fires, or explosions, or that may contribute to the harboring of rats and other pests;
- Place stored materials inside buildings that are under construction and at least 6 feet from hoist ways, or inside floor openings and at least 10 feet away from exterior walls;

- Separate noncompatible material; and
- Equip employees who work on stored grain in silos, hoppers, or tanks, with lifelines and safety belts.

In addition, workers should consider placing bound material on racks, and secure it by stacking, blocking, or interlocking to prevent it from sliding, falling, or collapsing.

What safeguards must workers follow when stacking materials?

Stacking materials can be dangerous if workers do not follow safety guidelines. Falling materials and collapsing loads can crush or pin workers, causing injuries or death. To help prevent injuries when stacking materials, workers must do the following:

- Stack lumber no more than 16 feet high if it is handled manually, and no more than 20 feet if using a forklift;
- Remove all nails from used lumber before stacking;
- Stack and level lumber on solidly supported bracing;
- Ensure that stacks are stable and self-supporting;
- Do not store pipes and bars in racks that face main aisles to avoid creating a hazard to passersby when removing supplies;
- Stack bags and bundles in interlocking rows to keep them secure; and
- Stack bagged material by stepping back the layers and cross-keying the bags at least every ten layers (to remove bags from the stack, start from the top row first).

During materials stacking activities, workers must also do the following:

- Store baled paper and rags inside a building no closer than 18 inches to the walls, partitions, or sprinkler heads;
- Band boxed materials or secure them with cross-ties or shrink plastic fiber;
- Stack drums, barrels, and kegs symmetrically;
- Block the bottom tiers of drums, barrels, and kegs to keep them from rolling if stored on their sides;
- Place planks, sheets of plywood dunnage, or pallets between each tier of drums, barrels, and kegs to make a firm, flat, stacking surface when stacking on end;
- Chock the bottom tier of drums, barrels, and kegs on each side to prevent shifting in either direction when stacking two or more tiers high; and
- Stack and block poles as well as structural steel, bar stock, and other cylindrical materials to prevent spreading or tilting unless they are in racks.

In addition, workers should do the following:

- Paint walls or posts with stripes to indicate maximum stacking heights for quick reference;
- Observe height limitations when stacking materials;
- Consider the need for availability of the material; and
- Stack loose bricks no more than 7 feet in height. (When these stacks reach a height of 4 feet, taper them back 2 inches for every foot of height above the 4-foot level. When masonry blocks are stacked higher than 6 feet, taper the stacks back one-half block for each tier above the 6-foot level.)

Basic Safety and Health Principles

Employers can reduce injuries resulting from handling and storing materials by using some basic safety procedures such as adopting sound ergonomics practices, taking general fire safety precautions, and keeping aisles and passageways clear.

What Is Ergonomics?

Ergonomics is defined as the study of work and is based on the principle that the job should be adapted to fit the person rather than forcing the person to fit the job. Ergonomics focuses on the work environment, such as its design and function, as well as items—such as the design and function of work stations, controls, displays, safety devices, tools, and lighting to fit the employees' physical requirements and to ensure their health and well being.

Ergonomics includes restructuring or changing workplace conditions, to make the job easier, and reducing stressors that cause musculoskeletal disorders. In the area of materials handling and storing, ergonomic principles may require controls such as reducing the size or weight of the objects lifted, installing a mechanical lifting aid, or changing the height of a pallet or shelf.

Although no approach completely eliminates back injuries resulting from lifting materials, you can prevent a substantial number of lifting injuries by implementing an effective ergonomics program and by training your employees in appropriate lifting techniques.

What About Fire Safety?

In adhering to fire safety precautions, instruct employees that flammable and combustible materials must be stored according to their fire characteristics. Flammable liquids, for example, must be separated from other material by a fire wall. Also, other combustibles must be stored in an area

where smoking and using an open flame or a spark-producing device is prohibited. Dissimilar materials that are dangerous when they come into contact with each other must be stored apart.

What About Aisles and Passageways?

When using aisles and passageways to move materials mechanically, workers must allow sufficient clearance for aisles at loading docks, through doorways, wherever turns must be made, and in other parts of the workplace. Providing sufficient clearance for mechanically-moved materials will prevent workers from being pinned between the equipment and fixtures in the workplace, such as walls, racks, posts, or other machines. Sufficient clearance also will prevent the load from striking an obstruction and falling on an employee.

Employers must ensure that all passageways that workers use remain clear of obstructions and tripping hazards. Workers should not store materials in excess of supplies needed for immediate operations in aisles or passageways, and employers must mark permanent aisles and passageways appropriately.



Warehouse Fire Safety

By Dave Piasecki

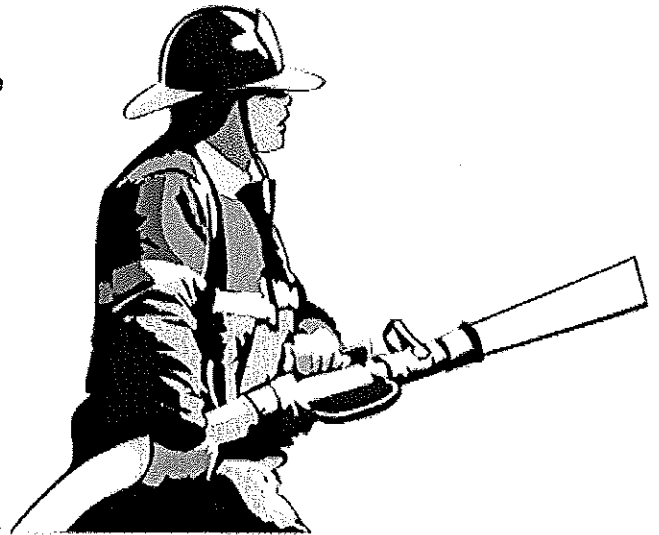
When companies think about warehouse fire safety, they usually think of compliance to fire codes and OSHA regulations. While compliance is a good starting point (and is obviously mandatory), there is more to warehouse fire safety than compliance. Below are a few misconceptions about warehouse fire safety.

- ◆ My warehouse just passed a fire inspection therefore it must be up to code.
- ◆ My warehouse is up to code therefore it must be safe.
- ◆ My warehouse was designed with a sprinkler system therefore it can't burn down.

I must admit that like many other warehouse professionals I spent many years taking this "ignorance is bliss" approach to fire safety. As much as we all talk about safety coming first, safety projects rarely rate high on our prioritized project lists. The difficulty in obtaining applicable safety and compliance information and the fear of opening a "can-o-worms" by using outside help combined with the fact that you may have just passed a fire inspection makes it easier to justify perpetuating ignorance of safety issues. And certainly most companies can operate under these conditions and never have a serious fire. Unfortunately, some companies will have a serious fire and the difference between a small financial loss and a catastrophic loss with the potential for loss of life will come down to the level of fire safety knowledge and the application of that knowledge to warehouse design and operational practices.

Fire inspections can vary significantly from one jurisdiction to another and from one inspector to another. An inspector in a primarily residential community will likely not be as knowledgeable in the codes related to high-piled storage as an inspector in an industrial area. An inspector that's been involved in fighting a large warehouse fire will likely have a higher sensitivity to certain issues than one that has not had the same experience.

Generally, fire inspections are looking for housekeeping-type hazards such as blocked exits, blocked aisles, damaged sprinkler systems, missing or neglected fire extinguishers and exit lights, accumulations of flammable debris, or misuse of electrical equipment such as extension cords. A fire inspector can't possibly inspect and evaluate the hazard classifications of all the product stored and verify the engineering specifications of a sprinkler system on a walk through inspection. If you've made changes to the composition of the products being stored, the types of packaging used, or the storage configuration, it is unlikely that the inspector will be aware of this unless you bring it to his or her attention. And when is the last time you volunteered to give unsolicited information during an inspection.



Fire codes are designed to achieve a minimum level of safety; even though the level of detail in the codes is extensive they can't possibly cover every hazard or combinations of hazards. To use traffic laws as an analogy, just because you are obeying traffic laws does not mean that you will not get into an accident. The same is true of fire codes; they are designed to reduce the opportunities for fires to start, reduce the opportunities for fires to spread, provide for evacuation of occupants, and provide access for fire fighters to extinguish the fire.

Sprinkler systems are engineered to cover a specific commodity classification in a specific storage configuration. Changes such as introducing a new product line, using a different packaging material, or changing from wood pallets to plastic pallets can increase your hazard classification and render your sprinkler system inadequate to control a fire. Also, changing the size of pallets or the way product is stacked in racking can infringe on flu space requirements, reducing the ability of the sprinkler system to control a fire. It's also a common misconception that sprinkler systems are designed to extinguish fires. Although they can be designed to extinguish fires, systems designed to meet minimum code requirements are only expected to help control the spread of the fire until the fire department arrives to extinguish it. The fact is, every year buildings with inadequate sprinkler systems burn to the ground.

So how do you determine the level of fire protection your warehouse has/needs? I recommend a combination of a little education and employing the services of a fire protection engineer. Interpreting fire codes can get very complicated and

evaluating your system's engineering is not a do-it-yourself project. However, having someone on staff with some basic knowledge of the fire codes will help you ensure you get the best results from working with a fire protection engineer and allow you to quickly identify when operational changes may compromise the original fire protection design. Balancing safety issues with operational issues is rarely a simple task. An overly cautious fire protection design may result in significant loss of storage capacity, high costs, or create ongoing maintenance issues (such as those related to in-rack sprinklers) without necessarily reducing your exposure to hazards. While an under designed system could mean loss of life and property.

Intro to fire codes. The best way to become familiar with the fire codes is to read the codebooks. If there is a fire codebook written for amateurs, I am unaware of it, so you're going to have to spend some time learning to navigate the actual codebooks and interpret the codes. To make this a little more confusing, there are a number of organizations that publish fire codes. Individual states and municipalities will then adopt the codes put out by a specific organization. In addition, the states or municipalities can also amend the codes they adopt to include additional codes. There are also a lot of provisions left up to the discretion of the local fire chief. Just a note: In the event of conflicts interpreting the fire code, the fire code is "whatever the local fire chief says it is".

Recently the Building Officials and Code Administrators International, Inc (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International, Inc. (SBCCI) got together forming the International Code Council (ICC). This new organization put out the 2000 International Fire Code (2003 International Fire Code is now available) in an effort to standardize the fire codes. For educational purposes I would recommend using this code. For the most part, all of the various codes are similar and since you should be using an expert for the detailed evaluation, I think this should be sufficient. You will find in going through the codes that in certain cases you may be referred to a separate publication for additional code information such as publications put out by the National Fire Protection Association (NFPA) on specifications for sprinkler systems or storage of aerosols.

While the codebooks may at first seem confusing, you can obtain a good overview of the key requirements fairly quickly. You will also quickly learn why you will need expert help when it comes to the details of determining hazard classifications and code requirements. For information relating to warehousing, the best place to start is the section on *High-Piled Combustible Storage*. Generally, high-piled combustible storage codes apply to floor or racked storage exceeding 12 feet in height, however, at the discretion of the fire chief, the codes may also apply to high hazard commodity storage exceeding 6 feet in height. The codes use the combination of commodity hazard classifications, size of storage area (square footage), maximum storage height, material handling methods, and storage configurations (solid-piled storage, racked storage, shelf storage, decking type, storage height, etc.) to determine sprinkler density, flue space requirements, aisle widths, as well as the need for building access, smoke and heat removal systems, curtain boards, fire walls, and in-rack sprinklers.

The following are some code requirements and recommendations that apply to many warehouse operations. I'll again note that specific code requirements will vary depending upon your municipality and storage characteristics.

- Although some smaller warehouses may not legally require them, automated sprinkler should be considered as standard requirement in any warehouse.
- Storage should be maintained at least 18 inches below sprinkler head deflectors.
- In racked storage, transverse flue spaces of at least 3 inches should be maintained. Transverse flue space is the space to either side of a racked pallet.
- In racked storage, longitudinal flue spaces of at least 6 inches should be maintained. Longitudinal flue space is the space between the rows of back-to-back rack. It is important to note that the flue space is measured as the distance between the loads, not the distance between the racks. In a standard pallet rack configuration you will usually have 3 inches of pallet overhang, calculating this into the flue space would require the rows of rack to be at least 12 inches apart.
- Most warehouses meeting the above flue space requirements do not require in-rack sprinkler systems. Racking with solid decking, storage configurations that prevent maintaining the flue spaces, storage of high hazard materials, or storage greater than 40 feet in height will probably require in-rack sprinklers.
- Dead end aisles must not be more than 50 feet in length.
- In solid piled floor storage there must be an aisle at least every 100 feet and within 50 feet of walls when materials are stored against the wall. Essentially this means that any portion of the solid piled storage should be within 50 feet of an aisle.
- During restocking operations using manual stocking methods (using stock carts, rolling ladders, etc.) a minimum unobstructed aisle width of 24 inches or ½ the aisle width, whichever is greater, must be maintained.
- During mechanical stocking operations a minimum unobstructed aisle width of 44 inches must be maintained.
- Automated material handling equipment such as carousels and ASRS units will have additional code requirements

to prevent the equipment's motion from spreading a fire.

- ◆ Smoking is prohibited in warehouses and no smoking signs are required.
- ◆ Battery charging areas have specific code requirements including ventilation, acid neutralization, eye wash stations, and spill control systems.
- ◆ Liquid Propane fuel cylinders used on LP forklifts should not be stored within 20 feet of fire exits and are limited to a maximum quantity of 300 lbs per storage location. This is the equivalent of six 43 lb cylinders or nine 33lb cylinders. Empty cylinders are considered full for this calculation. If additional storage locations are required they must be separated by a minimum of 300 feet.
- ◆ One word: Plastics. Plastic content is the single storage characteristic most likely to contribute to a class IV or Class V high-hazard commodity classification. The classification is based upon the type of plastic and the overall content, measured by percent by weight for unexpanded plastics and percent by volume and weight for expanded plastics. This is where operational changes such as changing packaging materials from paper based to polystyrene or changing from wooden to plastic pallets can have a substantial impact.
- ◆ Another word: Aerosols. "Rocketing" is a term used to describe the ability of aerosol containers to propel themselves across a warehouse, carrying a trail of fire behind them. There is a whole series of codes dedicated to the storage requirements for aerosol products. Depending upon the chemical content and the amount of aerosols stored (measured by weight), separation areas, chain-link fence enclosures, fire walls, and additional sprinkler protection may be required.
- ◆ One last word: Hazardous Materials. Flammable liquids, solids, and gasses, explosives, oxidizers, and reactive materials fall under the category of Hazardous materials and have their own series of codes that apply. You're definitely going to need some expert guidance when storing these types of materials.

Obviously there are a lot of other code requirements including basic fire safety requirements such as not blocking fire exits and maintenance and placement of portable fire extinguishers. And, in addition to the fire codes you may also be subject to OSHA and EPA regulations.

Beyond Compliance. As previously mentioned, compliance is only intended to provide a certain minimum level of safety. When working with a fire protection engineer you will likely want to incorporate additional safety measures. When designing a new system it is also recommended to investigate installing a design capable of handling a higher hazard classification. Should your product line or storage needs change in the future it can be very expensive to change your existing system to accommodate the higher hazard classification. There are also a lot of operational issues that relate to fire safety that should be considered. Like everything else in your operation, the level of fire safety will be greatly impacted by the procedures and training provided to the employees.

- ◆ Evacuation Plans. It is extremely important to make it absolutely clear to employees what they are expected to do in the event of a fire or the sounding of the fire alarm. The most common reaction by employees to the fire alarm sounding is to look to their supervisor to see if they should leave the building, or look to other employees to see what they are doing. Employees should be informed that whenever they hear the fire alarm they should immediately leave the building unless they have been given previous notification of an alarm test. It should also be made clear that they should leave through the nearest exit. Warehouse workers are usually not stationary so assigning a specific exit rarely applies. I recall an employee during a drill walking across the entire warehouse, passing several fire exits on his way to his "assigned" exit. Now I would certainly hope that had the employee seen an actual fire, he would not have walked into it to get to his assigned exit, but "you never know". Also, if employees are required to perform certain tasks prior to leaving the building, such as shutting down a piece of equipment, they should be given specific instructions on the task and also under what conditions they should perform the task and under what conditions they should immediately evacuate.
- ◆ Fire Extinguisher Training. Employees should be trained on the use and locations of fire extinguishers. This is especially true of employees working in areas where there are known ignition sources.
- ◆ Trash Accumulation. Large accumulations of trash and debris can be a potential fire hazard as well as a hindrance to evacuation. Adequate containers should be provided and specific duties assigned for removing the trash as containers fill. There should also be designated areas for storage of pallets, crates, etc. It's also a good idea to limit the stack height of loose pallets to six feet.
- ◆ Designate floor storage and staging areas. Using tape or paint to designate floor areas approved for storage or staging of materials will make it easier to enforce safety issues related to blocked aisles etc.
- ◆ Incorporate safety training into your regular operational procedures and training. Safety procedures and training are often handled as a separate issue. You'll find it more effective to incorporate safety procedures into your specific task procedures and training. Issues related to clear flue spaces, sprinkler clearance, aisle clearances,

evacuation plans, battery charging and propane cylinder handling should be part of the employee's regular training program.

- Maintain open communication with your local fire department. Make sure the fire department is aware of the additions of high hazard materials to your warehouse or changes in storage configurations. If you do have a fire it's extremely important that the fire fighters know what they are walking into.
- Make sure additional precautions are taken during construction and maintenance projects. If you have contractors working in or around your building, make sure additional measures such as additional fire extinguishers are used, especially if work is being done on a roof or other area where fire extinguishers are not present. Also make special plans if you have to shut down the sprinkler system for any reason. You may need to shut down certain operations, provide supplemental fire protection, or provide physical 24 hr monitoring of the building during this period.

Maintaining an environment that provides safety to occupants and reduces the risk of property loss requires not only the initial system engineering, but also attention to safety in day-to-day operational practices and the knowledge of when operational changes may require re-evaluation of your fire protection systems.

Your Local Fire Department Needs You.

Budgetary constraints often make it difficult for fire departments to acquire all the equipment they need to meet the challenges of protecting lives and property. While a lack of equipment won't stop the firefighters from fighting fires, it may make it more dangerous for them to do so as well as making it more difficult to save lives. Local companies can help by contacting their local fire chief to see what types of equipment they are in need of and donate funds towards the purchase of the equipment or actually buy the equipment and donate it to the department.

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Training and Education

OSHA recommends that employers establish a formal training program to teach workers how to recognize and avoid materials handling hazards. Instructors should be well-versed in safety engineering and materials handling and storing. The training should reduce workplace hazards by emphasizing the following factors:

- Dangers of lifting without proper training.
- Avoidance of unnecessary physical stress and strain.
- Awareness of what a worker can comfortably handle without undue strain.
- Use of equipment properly.
- Recognition of potential hazards and how to prevent or correct them.

Should the prevention of some injuries receive special emphasis?

Yes. Because of the high incidence of back injuries, both supervisors and employees should demonstrate and practice safe manual lifting techniques. Training programs on proper lifting techniques should cover the following topics:

- Health risks of improper lifting, citing organizational case histories, vs the benefits of proper lifting.
- Basic anatomy of the spine, muscles, and joints of the trunk, and the contributions of intra-abdominal pressure while lifting.
- Body strengths and weaknesses—determining one's own lifting capacity.
- Physical factors that might contribute to an accident and how to avoid the unexpected.

- Safe postures for lifting and timing for smooth, easy lifting.
- Aids such as stages, platforms, or steps, trestles, shoulder pads, handles, and wheels.
- Body responses—warning signals—to be aware of when lifting.

How can employers make their training programs more effective?

To have an effective safety and health program covering materials handling and storing, your managers must take an active role in its development. You must convince first-line supervisors of the importance of controlling hazards associated with materials handling and storing and hold them accountable for employee training. An ongoing safety and health management system can motivate employees to continue using necessary protective gear and observing proper job procedures. Instituting such a program, along with providing the correct materials handling equipment, can enhance worker safety and health in the area of materials handling and storing. More training information is located at <http://www.osha.gov/SLTC/safetyhealth/index.html>. For more help, contact the OSHA Training Institute or the regional or area office nearest to you. (See “How Can OSHA Help Me?” at the end of this booklet.)

Important Safety Measures

To reduce the number of accidents associated with workplace equipment, employers must train employees in the proper use and limitations of the equipment they operate. In addition to powered industrial trucks, this includes knowing how to safely and effectively use equipment such as conveyors, cranes, and slings.

What safety measures should employers take regarding conveyors?

When using conveyors, workers may get their hands caught in nip points where the conveyor medium runs near the frame or over support members or rollers. Workers also may be struck by material falling off the conveyor, or they may get caught in the conveyor and drawn into the conveyor path as a result. To prevent or reduce the severity of an injury, employers must take the following precautions to protect workers:

- Install an emergency button or pull cord designed to stop the conveyor at the employee's work station.
- Install emergency stop cables that extend the entire length of continuously accessible conveyor belts so that the cables can be accessed from any location along the conveyor.
- Design the emergency stop switch so that it must be reset before the conveyor can be restarted.
- Ensure that appropriate personnel inspect the conveyor and clear the stoppage before restarting a conveyor that has stopped due to an overload.
- Prohibit employees from riding on a materials-handling conveyor.
- Provide guards where conveyors pass over work areas or aisles to keep employees from being struck by falling

material. (If the crossover is low enough for workers to run into it, mark the guard with a warning sign or paint it a bright color to protect employees.)

- Cover screw conveyors completely except at loading and discharging points. (At those points, guards must protect employees against contacting the moving screw. The guards are movable, and they must be interlocked to prevent conveyor movement when the guards are not in place.)

What safety measures should employers take regarding cranes?

Employers must permit only thoroughly trained and competent workers to operate cranes. Operators should know what they are lifting and what it weighs. For example, the rated capacity of mobile cranes varies with the length of the boom and the boom radius. When a crane has a telescoping boom, a load may be safe to lift at a short boom length or a short boom radius, but may overload the crane when the boom is extended and the radius increases.

To reduce the severity of an injury, employers must take the following precautions:

- Equip all cranes that have adjustable booms with boom angle indicators.
- Provide cranes with telescoping booms with some means to determine boom lengths unless the load rating is independent of the boom length.
- Post load rating charts in the cab of cab-operated cranes. (All cranes do not have uniform capacities for the same boom length and radius in all directions around the chassis of the vehicle.)

- Require workers to always check the crane's load chart to ensure that the crane will not be overloaded by operating conditions.
- Instruct workers to plan lifts before starting them to ensure that they are safe.
- Tell workers to take additional precautions and exercise extra care when operating around power lines.
- Teach workers that outriggers on mobile cranes must rest on firm ground, on timbers, or be sufficiently cribbed to spread the weight of the crane and the load over a large enough area. (Some mobile cranes cannot operate with outriggers in the traveling position.)
- Direct workers to always keep hoisting chains and ropes free of kinks or twists and never wrapped around a load.
- Train workers to attach loads to the load hook by slings, fixtures, and other devices that have the capacity to support the load on the hook.
- Instruct workers to pad sharp edges of loads to prevent cutting slings.
- Teach workers to maintain proper sling angles so that slings are not loaded in excess of their capacity.
- Ensure that all cranes are inspected frequently by persons thoroughly familiar with the crane, the methods of inspecting the crane, and what can make the crane unserviceable. Crane activity, the severity of use, and environmental conditions should determine inspection schedules.
- Ensure that the critical parts of a crane—such as crane operating mechanisms, hooks, air, or hydraulic system components and other load-carrying components—are inspected daily for any maladjustment, deterioration, leakage, deformation, or other damage.

What must employers do to ensure the safe use of slings?

As an employer, you must designate a competent person to conduct inspections of slings before and during use, especially when service conditions warrant. In addition, you must ensure that workers observe the following precautions when working with slings:

- Remove immediately damaged or defective slings from service.
- Do not shorten slings with knots or bolts or other makeshift devices.
- Do not kink sling legs.
- Do not load slings beyond their rated capacity.
- Keep suspended loads clear of all obstructions.
- Remain clear of loads about to be lifted and suspended.
- Do not engage in shock loading.
- Avoid sudden crane acceleration and deceleration when moving suspended loads.

What must employers do to protect workers who operate powered industrial trucks?

Workers who handle and store materials often use fork trucks, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electrical motors or internal combustion engines. Employers must make these workers aware of the safety requirements pertaining the design, maintenance, and use of these trucks.

What are the safety requirements for design?

All new powered industrial trucks, except vehicles intended primarily for earth moving or over-the-road hauling, must meet the design and construction requirements for powered industrial trucks established in the *American National Standard for Powered Industrial Trucks, Part II*, ANSI B56.1-1969. Trucks approved for fire safety also must bear a label, or some other identifying mark, indicating acceptance by a nationally recognized testing laboratory.

What are the safety requirements for modification?

You and your employees must not make modifications and additions affecting capacity and safe operation of the trucks without the manufacturer's prior written approval. In these cases, you must change capacity, operation, and maintenance instruction plates and tags or decals to reflect the new information. If the truck is equipped with front-end attachments that are not factory installed, the user must request that the truck be marked to identify these attachments and show the truck's approximate weight—including the installed attachment—when it is at maximum elevation with its load laterally centered.

What are the safety requirements for designation?

There are 11 different designations of industrial trucks, and each designation is suitable for use in certain locations and under specific conditions. Workers must not use powered industrial trucks in atmospheres containing hazardous concentrations of the following substances:

- Acetylene
- Butadiene

- Acetaldehyde
- Cyclopropane
- Ethylene
- Isoprene
- Hydrogen (or gases or vapors equivalent in hazard to hydrogen)
- Ethylene oxide
- Propylene oxide
- Diethyl ether
- Unsymmetrical dimethyl hydrazine

In addition, workers may not use these trucks in atmospheres containing hazardous concentrations of metal dust, including aluminum, magnesium, and other metals of similarly hazardous characteristics. In atmospheres containing carbon black, coal, or coke dust, workers may use only approved powered industrial trucks designated as EX. Where dusts of magnesium, aluminum, or bronze may be present, fuses, switches, motor controllers, and circuit breakers of trucks must have enclosures specifically approved for such locations.

Some powered industrial trucks are designed, constructed, and assembled for use in atmospheres containing flammable vapors or dusts. These include powered industrial trucks equipped with the following:

- Additional safeguards to their exhaust, fuel, and electrical systems;
- No electrical equipment (including the ignition);
- Temperature limitation features; and
- Electric motors and all other electrical equipment completely enclosed.

Workers may use these specially designed powered industrial trucks in locations where volatile flammable liquids or flammable gases are handled, processed, or used. The liquids, vapors, or gases should be confined within closed containers or closed systems and not allowed to escape. These trucks are approved and generally designated as DS, DY, ES, EE, EX, GS, or LPS. See Title 29 of the *Code of Federal Regulations (CFR)* Part 1910.178(b) for more detail on these designations.

What safety precautions should employers and workers observe when operating or maintaining powered industrial trucks?

When operating or maintaining powered industrial trucks, you and your employees must consider the following safety precautions:

- Fit high-lift rider trucks with an overhead guard if permitted by operating conditions.
- Equip fork trucks with vertical load backrest extensions according to manufacturers' specifications if the load presents a hazard.
- Locate battery-charging installations in designated areas.
- Provide facilities for flushing and neutralizing spilled electrolytes when changing or recharging batteries to prevent fires, to protect the charging apparatus from being damaged by the trucks, and to adequately ventilate fumes in the charging area from gassing batteries.
- Provide conveyor, overhead hoist, or equivalent materials handling equipment for handling batteries.
- Provide auxiliary directional lighting on the truck where general lighting is less than 2 lumens per square foot.

- Do not place arms and legs between the uprights of the mast or outside the running lines of the truck.
- Set brakes and put other adequate protection in place to prevent movement of trucks, trailers, or railroad cars when using powered industrial trucks to load or unload materials onto them.
- Provide sufficient headroom under overhead installations, lights, pipes, and sprinkler systems.
- Provide personnel on the loading platform with the means to shut off power to the truck whenever a truck is equipped with vertical only (or vertical and horizontal) controls elevatable with the lifting carriage or forks for lifting personnel.
- Secure dockboards or bridge plates properly so they won't move when equipment moves over them.
- Handle only stable or safely arranged loads.
- Exercise caution when handling tools.
- Disconnect batteries before repairing electrical systems on trucks.
- Ensure that replacement parts on industrial trucks are equivalent to the original ones.

Are there any training requirements for operators of powered industrial trucks?

Yes. Effective March 1, 1999, employers must develop a training program specific to the type of truck to be driven and the working conditions encountered. Employers must also evaluate the operator's performance in the workplace and certify that each operator has successfully received the training needed. The certification must include the name of the operator, the date of training, the date of evaluation, and

the identity of the person(s) performing the training or evaluation. In addition, you must conduct an evaluation of each powered industrial truck operator's performance at least once every 3 years.

You must also conduct such an evaluation as well as refresher training if one of the following applies:

- Operator is observed operating the vehicle in an unsafe manner;
- Operator is involved in an accident or near-miss incident;
- Operator receives an evaluation revealing unsafe operation of the truck;
- Operator is assigned to drive a different type of truck; or
- Condition in the workplace changes in a manner that could affect safe operation of the truck.

For more information contact your Regional OSHA office or visit our website at http://www.osha.gov/Training/PIT/pit_menu.htm. For more detailed information on powered industrial trucks, overhead and gantry cranes, and slings, see 29 *CFR* Part 1910.178 through 1910.184 Subpart N.



Lift Truck Basics

By Dave Plasecki

Would you purchase an RV to use for your daily commute to work in the city, or use a sports car for hauling lumber to job sites? Sounds ridiculous, however, some companies make comparable mistakes when procuring lift trucks for their operations. There is an enormous variety of configurations and options available for the modern lift truck going far beyond weight capacity and lift height. Doing a little homework up front to ensure you are choosing the best vehicles for your operation will result in optimal utilization of your space and labor while maintaining a high safety factor.

Before making a decision on the best vehicle for your operation you must have a thorough understanding of the properties of the materials you will be handling (loads), the methods you will use to store these materials and the methods you will use to ship and receive these materials. Once this is done you should familiarize yourself with the variety of vehicles and options available (see my [Lift Truck Pics](#) page and also spend some time at the various manufacturers sites listed on my [Links Page](#)). Below I have listed some of the different types of vehicles and their functionality.

Fuel Types

Electric. Electric vehicles are designed for indoor use only. Their big advantages are the absence of fumes and their quiet operation. If you only intend to use your vehicles indoors, this is the way to go. In multi-shift operations you will need additional batteries and charging/transfer stations. In single shift operations, or, if the truck is not used 100% of the time, you can charge it during off hours. Note that the batteries and chargers for lift trucks are usually priced separately from the lift truck itself. You will also have choices of standard batteries or sealed maintenance-free types.

AC or DC. Recently AC (alternating current) motors are being offered by several lift truck manufacturers, and no, this does not mean that you will be driving around with a really long extension cord. AC powered lift trucks run off of DC batteries and convert the DC power back to AC to power the motor. The advantages of AC motors include faster acceleration, higher efficiency, and lower maintenance costs.

Regenerative braking. This technology recharges the batteries using the momentum of the lift truck when slowing down (braking). The frequent starting/stopping of lift trucks make them an excellent application for this technology. Similar to the technology used in hybrid automobiles.

Fast charging. Fast charging provides a means to reduce or eliminate the need to change batteries on multi-shift operations. The idea here is to quickly recharge the batteries during breaks, lunches, and between shifts (frequently called opportunity charging). Though more expensive than conventional charging systems, fast charging is growing in popularity.

LP Liquid Propane. Advantages of using LP include minimal fumes (however heavy use indoors requires adequate ventilation), the ability to use both indoors and outdoors, and the ability to quickly change LP tanks. Commonly used in indoor/outdoor operations such as lumber yards.

Gasoline or Diesel. Outdoor use only. Heavily used in construction, scrap yards, etc.

Fuel-cell Technology??? There are a handful of companies already testing hydrogen fuel cell power sources for industrial trucks (more information on hydrogen fuel cells available at GeneralHydrogen.com or cellexpower.com). The advantages of hydrogen fuel cell power include the ability to quickly refuel (similar to LP, Gas, or Diesel) avoiding the hassles and costs associated with battery changing/charging while providing the clean-air benefits of electric. Cost is still an issue at this point, but this is a technology to watch.

Tire Types

Cushion Tires are solid tires generally with no tread pattern (though tread patterns are available) designed for

use indoors on smooth solid surfaces.

Pneumatic tires require air and are designed for use outdoors on uneven and loose surfaces. Pneumatic tire trucks will also have higher ground clearance which raises the center of gravity thus reducing its rated lift capacity.

Lift Capacity and Lift Height.

You will need to know the maximum weight and dimensions of the loads you will be handling as well as the maximum fork height needed to stack or rack the loads in order to determine the capacity of the vehicle needed. The lift capacity of a truck is affected by lift height and load size. A larger size load moves the center of gravity of the vehicle/load combination reducing the lift capacity as does the height the load is being lifted. Attachments also affect the capacity of a truck. Every lift truck is required to have a placard showing the rated capacities. If there are any changes made to the truck — like adding an attachment — the placard must be replaced with one showing the revised capacities. Why spend so much time on capacity? Why not just play it safe and get a higher rated truck? The answer is size. Bigger is not necessarily better in warehousing. A higher capacity truck will be physically larger and require larger aisles than a lesser one.

Mast Options

Single, double, triple, quad (reflects the number of sections or stages the mast has) these are the types of masts available. In many circumstances you will not need to make a choice here since the lift height will dictate the type of mast you will get, however, in trucks with very high lift heights you may have an option. Going to a quad mast instead of a triple, rated at the same height, will give you a shorter mast in the lowered position, eliminating overhead clearance issues. However, the more sections to the mast the more play it will have when extended (the wobble factor).

Aisle Types

Lift trucks are classified by the types of aisles they are designed to operate in. Wide Aisle and Narrow Aisle trucks are designed to turn in the aisle while Very Narrow Aisle trucks do not turn within the aisle. Read my article on [Aisle Widths](#) for more info.

Wide Aisle. Standard forklifts fall into this category of trucks designed to work in aisles greater than 11' wide.

Narrow Aisle (NA). Narrow aisle trucks operate in aisles of 8' to 10' and are generally stand up vehicles such as Reach Trucks.

Very Narrow Aisle (VNA). Very narrow aisle trucks operate in aisles less than 6' and often use guidance systems (wire, rail, or optical) to travel within the aisles. Types of VNA trucks are Order Selectors, Swing Mast, and Turret Trucks.

Truck Types

Standard forklift. The standard forklift, also known as a counterbalanced sit-down lift truck, is the vehicle most people think of when they think Lift truck or Forklift. It is available with any of the fuel types and tire types as well as numerous weight capacities, lift heights and attachment options.

The smaller 3000 lb to 4000 lb trucks are the workhorses of most warehouses. If you are running a small operation and will only have one truck, this is probably the vehicle for you. The standard forklift is a wide aisle truck which requires at least 11' aisles to turn in. The aisle width is determined by the size of the truck, the turn radius, and the size of the load. Available options and attachments include side shifts, fork shifts, hydraulic clamps, and slip sheet attachments, to name a few. The side shift is becoming standard equipment on many trucks (I wouldn't purchase one without it).

Standard forklifts are usually used for lift heights under 20 feet.

Reach truck. a.k.a. Stand-up reach, Straddle reach, Double-deep reach. The reach truck is a narrow aisle (8'-10') truck designed specifically for racked pallet storage. It consists of outriggers in front and telescoping forks that use a hydraulic scissors-type mechanism that allows you to pick up the load and retract it over the outriggers. This reduces the overall truck and load length, allowing you to turn in a narrower aisle. Double-deep reach trucks use an extended reach mechanism which allows you to store pallets two deep in specially designed double-deep rack. Reach trucks are designed for racking areas only and do not work for loading trucks or quickly moving loads over distances. Operator training on reach trucks tends to take longer than on other vehicles due to the complexity of the controls.

Reach trucks are available with lift heights up to 40 feet, however, I don't recommend using them over 30 feet as it becomes very difficult to place loads at that height and puts a lot of strain on the operator's neck and eyes.

Motorized pallet truck. a.k.a. Walkie, Walkie-rider, Rider.. Motorized pallet trucks are the motorized version of the pallet jack. They come in "Walkie" versions or "Rider" versions. As you would expect the walkie is designed for the operator to walk along with the truck as they move loads, while the Rider has a small platform which the operator stands on. The riders work great for frequent moving of loads over extended distances within warehouses and manufacturing operations. They are fast and highly maneuverable. Minimal controls result in short learning curves for operators although precision turning takes a little practice. Since there is no operator safety cage, there are some safety concerns with these and I do not recommend them for transporting tall unstable loads. If you are looking for an inexpensive method for moving loads from point A to point B, a rider may be the answer. If you are moving heavy loads short distances and are looking for an employee-friendly option to the pallet jack, check out a walkie.

Order selector a.k.a. Order picker. Designed specifically for manual handling of less-than-pallet-load quantities in racking. Man-up design has fixed forks attached to a platform which elevates the load and the operator to facilitate manual loading and unloading from racking. Order Selectors are very narrow aisles vehicles which operate in aisles of less than 6'. I also find order selectors very useful in cycle counting and physical inventories. Order selectors are available in lift heights up to 40 feet however 20 to 30 foot models are more common.

Swing masts, Turret trucks, and other VNA pallet handling vehicles.. Swing mast and turret trucks are very narrow aisle vehicles designed to work in aisles less than 6'. A swing mast truck resembles a standard forklift with the exception that there is an additional function to swing the mast to a 90 degree angle (only one direction) to allow stocking pallets perpendicular to direction of the truck's travel. The swing operation can get a little wobbly at heights so you must make sure you have stable secure loads (check links page for link to Drexel Industries for more info on swing masts). Most turret trucks are man-up vehicles similar to an order selector with the exception that rather than fixed forks the forks are mounted on an additional mast and carriage which operates as a turret turning 90 degrees in either direction facilitating picking and stocking on either side of the aisle. The man-up design makes it easier to handle loads in very tall racking (up to 40 feet). Man-down versions of turret trucks are also available. They are less expensive than the man-up versions and are better when rack heights are less than 30 feet. Very narrow aisle trucks are generally recommended to be used in conjunction with a guidance system (wire, rails, optical) within the aisles to increase safety and reduce property damage. Also, man-up turret trucks operating with tall racking require that the floor be perfectly flat and level to operate correctly (see links page for links to Raymond, Crown, Hyster, and Yale for more info on Turrets). VNA pallet handling vehicles can be a little pricey, last time I checked, man-down vehicles were running \$50k to \$70k and man-up Turrets running up to \$100k. This does not include the guidance systems. This cost can be easily offset in large warehouses by the space saved by going to 6' aisles.

Attachments / Options

There is an enormous variety of attachments and options available for lift trucks. While most attachments are designed for use on standard lift trucks, some of them are also used on reach trucks and VNA trucks. It's important to note that OSHA requires that any attachment used must be approved for use by the specific lift truck manufacturer. This regulation pretty much forces you to go through the OEM dealer for the purchase and installation of the attachment. Also note that most attachments will change the capacity of the lift truck and a new placard should be placed on the truck showing the new specs. Below I will list some of the more common types of attachments.

Sideshift. This is the most common attachment and, as I stated earlier, should be considered standard equipment. The sideshift device allows the fork carriage to slide left and right to allow more accurate placement of the load. Sideshifts will increase productivity and safety as well as reduce product damage by allowing the operator more flexibility in load placement.

Fork positioner. Fork Positioners allow the operator to adjust the distance between the forks without getting off of the truck. Used primarily in high volume operations where there is a great variety of pallet and crate sizes handled.

Fork pivot. Allows the forks and carriage to pivot (rotate). Used for transporting and dumping specially designed hoppers.

Slip sheet attachment. Slip sheet attachments are used where slip sheets (a sheet of cardboard, paperboard, or plastic) are used rather than pallets. The slip sheet attachments has a push/pull mechanism that clamps onto the slip sheet and pulls the load onto a thin platform and then pushes the load off of the platform when the truck reaches the destination.

Paper roll clamp. Designed specifically for the handling of large paper rolls, the paper roll clamp clamps around the roll and also allows for a full 360 degree rotation.

Carton clamp. Operates like the paper roll clamp except the clamping surface is flat rather than circular.

Drum handling attachments. There are a lot of different designs for attachment used to handle 55 gallon drums. Some are smaller versions of a paper roll clamp while others may engage the upper rim of the drum, or the lower rings. Some drum attachments are capable of picking up multiple drums at the same time.

Prongs. A Prong is a specialized rod type attachment used for picking up rolls of materials such as carpet rolls, wire and cable spools, and rolled steel, by inserting the prong into the center of the spool.

Fork extensions. Fork extensions slide over the existing forks on the truck to allow you to pick up longer loads.

Height selector. A height selector is an option that allows you to preset certain fork heights to correspond with rack levels. This option is most commonly used on reach trucks working at heights above 20 ft.

Tilt control. Tilt control allows you to preset fork tilt angles.

Safety Features.

There are many safety features that are common to specific types of trucks such as seat belts on sit-down vehicles and dead-man pedals on most stand-up vehicles. In addition, some manufacturers are offering additional features such as speed controls that reduce speed based on load height and steering angle. Read my articles on [Lift Truck Safety](#) and [Loading Dock Safety](#) for additional safety info.

Working with Dealer Reps.

Dealer reps can be a great source of information and will assist in determining the appropriate vehicles, however, keep in mind that truck types can vary significantly from manufacturer to manufacturer (especially on specialty equipment). Obviously the dealer rep will steer you towards something in his line regardless if there is a better alternative available elsewhere. When you have narrowed down the type of vehicle you are interested in, ask the rep to set up a visit to a similar operation using this type of vehicle and consider getting an onsite demo within your own facility. If you are still unsure I suggest renting one for a couple of months (ask upfront if you can deduct a portion of the rental cost from the purchase price if you decide to buy).

This certainly does not cover all of the vehicles and options available as there are many other specialty trucks as well as hybrids of the previous listed vehicles. It does cover most of the more popular types of trucks being used today. Remember an educated decision is a better decision.

Visit my [Lift Truck Pics](#) Page for more info also read my article [The Aisle Width Decision](#) for more detailed information on narrow aisles, very narrow aisles, and the equipment that operates in them.

Extra!!! After posting this article I found a great website for information related to operating and maintaining lift truck equipment called [Forklift Troubleshooting, Operation, Repairs, and Service](#). Another excellent site is [ForkliftAction.com](#). You may also want to visit [How to Buy a Forklift](#) for a book and price guide.

Return to Articles Main Page

Dave Piasecki, CPIM is owner/operator of [Inventory Operations Consulting LLC](#), a consulting firm providing services related to inventory management, material handling, and warehouse operations to manufacturers and distributors in Southeast Wisconsin and Northeast Illinois. He has over 15 years experience in warehousing and inventory management and can be reached through his website (<http://www.inventoryops.com>), where he maintains additional relevant information and links

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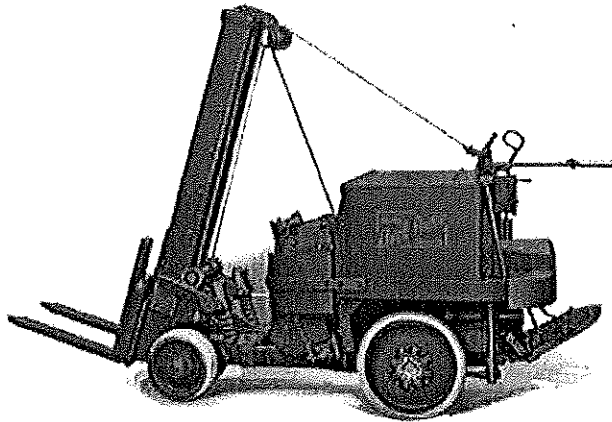
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Equipment Pics: Lift Trucks



Lift Trucks have come a long way since first being introduced in the early part of the 20th century as can be seen in this early photo of an Ellwell-Parker "Tiering Tractor". Their original purpose, the efficient movement of materials, however has not changed. Below I show examples of some of the most common types of lift trucks used in material handling. Since there are numerous configurations and specialty trucks not listed I suggest you check the manufacturers sites for additional info. If you're interested in the history of lift trucks and material handling, you'll want to download the video of a 1938 lift truck (similar to the one shown here) with a paper roll attachment from the Ellwell-Parker Company profile page. It's 22 MB so I strongly suggest downloading it to view later and not just clicking on it.

Also read my articles Lift Truck Basics and The Aisle Width Decision, and visit the Forklift Troubleshooting, Operation, Repairs, and Service site for more info.

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Lift Truck Links

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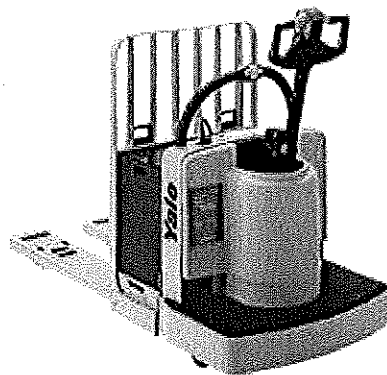
[Narrow Aisle Inc.](#)

[Ellwell-Parker](#)

[Atlet](#)

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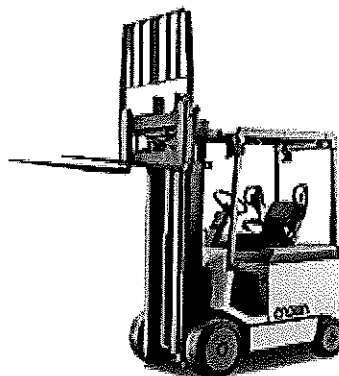
[Mulliton](#)



Courtesy of [Yale Materials Handling Corporation](#)

Motorized Pallet Truck (Rider Type)

The motorized version of the pallet jack, the rider type (shown) is used for frequent movement of pallet loads over distances such as movement between departments or storage areas. Also comes in a Walkie version that lacks the operator platform and higher speeds. Low cost and high maneuverability make these vehicles a good choice where frequent movement of loads is required. Options include double pallet length forks that allow you to move 2 pallets in one trip.



Courtesy of [Crown Equipment Corp.](#)

Electric Counterbalanced Lift Truck

Multipurpose vehicle used to load trailers, stack loads, rack loads, move pallet loads throughout facility. Requires wide aisle for turning (11' or more) Wide variety of attachments available. Electric is strictly indoor vehicle.

Equipment Pics

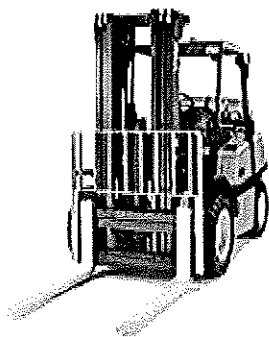
Lift Trucks

Racking

Dock Equipment

Conveyor Systems

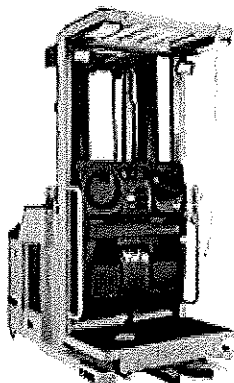
**Automated Material
Handling
Equipment**



Courtesy of Yale Materials Handling Corporation

Internal Combustion Counterbalanced Lift Truck

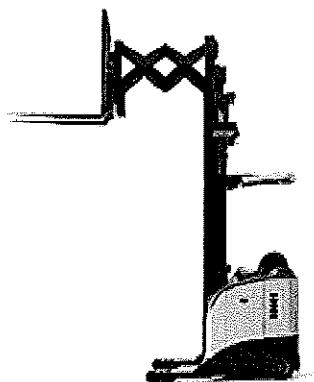
Functionality similar to electric truck above. Propane truck (shown) can be used indoors or out provided there is adequate ventilation.



Courtesy of Yale Materials Handling Corporation

Order Selector

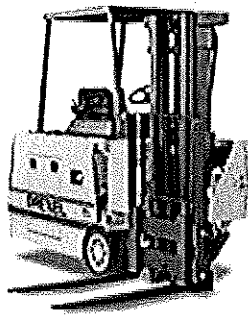
Man-up type vehicle designed specifically for hand loading less-than-pallet load quantities into and out of selective rack. Very narrow aisle (VNA) vehicle works in aisles less than 6' wide.



Courtesy of Crown Equipment Corp.

Reach Truck

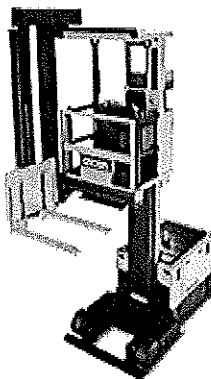
Narrow aisle truck (8'-11') designed specifically for racked pallet storage. Double-deep version (shown) loads pallets 2-deep in special double-deep racking.



Courtesy of Drexel Industries

Swing Mast Truck

Mast swings out 90 degrees to facilitate placement of pallets in racking in very narrow aisles (VNA) of less than 6'. Multipurpose functionality also allows it to be used for moving pallets and for loading trailers.



Courtesy of Crown Equipment Corp.

Turret Truck

Very narrow aisle truck (VNA) allows storage of pallet loads in racking with aisles less than 6' wide. Man-up design facilitates accurate placement in tall racking (up to 40 ft.). This type of vehicle generally requires a guidance system and extremely level floors.

Send mail to email@inventoryops.com with questions or comments about this web site.

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Forklift Safety: How Effective is your Lift Truck Safety Program?

By Dave Piasecki

Effective December 1999 all operators of industrial lift trucks were required to be trained and evaluated in accordance with the new OSHA ruling. Why did OSHA revise the requirements? Well the long story would detail years and years of studies on injuries and deaths resulting from industrial truck accidents, probable causes, possible prevention, statistics, statistics and even more statistics. An enormous amount of time and money was spent on this initiative. The short answer is "It needed to be done". The old ruling stated simply that *"Only trained and authorized operators shall be permitted to operate a powered industrial truck. methods should be devised to train operators in the safe operation of powered industrial trucks."* This ruling was far too vague in allowing companies to determine what adequate training was.

My Experience

My first experience driving a lift truck goes back almost 20 years. I had recently started working for this unnamed company and the guy than normally drives the forklift wasn't in so I hopped on the forklift and started playing with the controls to see what they did. A few minutes later I was moving product around the warehouse. A couple of months later the plant manager called me into his office and told me he needed to make sure that all the warehouse guys were certified to drive the forklift. He then said "I've seen you driving around the warehouse, you know how to drive the forklift, right", I answered "yeah". He signed a certification card, handed it to me and said, "you're certified". My experience was far from unique and even though common sense would say otherwise, my employer was arguably in compliance with the current OSHA standard.

Over the years I have been involved with in-house, outsourced, and prepackaged training and certification programs. What most of the programs had in common was minimal and very generic instruction, a very simple written test, and a quick driving test on usually a single forklift. The programs seemed to be more of a formality of going through the motions to provide documentation to support compliance in case "OSHA ever showed up" instead of being a safety initiative. This is how a lot of safety and compliance programs are conducted in businesses. Most companies put these programs in place with the best of intentions and never realize the shortcomings of the training until there is a serious accident.

The OSHA Rule

When I first sat down to read OSHA's Powered Industrial Truck Training; Final Rule, I'll admit I did not dive into the 60 plus page report with great enthusiasm. I was expecting to see a bunch of ridiculous bureaucratic requirements which would make our jobs more difficult and probably do very little for safety. What I found was a document which outlined legitimate safety concerns and provided detailed descriptions of areas which should be part of any operator training program. I was way impressed. In fact OSHA has gone beyond creating the legal document of the rule and has provided information in the form of course outlines, sample documents, and even a comprehensive PowerPoint® presentation. All of these materials are available at OSHA's Lift Truck Training and Reference Materials web page. I also suggest reading and incorporating the report on forklift fatalities into your training program, it is certainly an attention-getter. While the OSHA supplied materials alone do not make a complete training program, they certainly provide the foundation for one.

I'm purposely not going to detail the entire OSHA ruling since I feel it is important for those implementing safety programs to read the actual OSHA material. What I will do is go through some of the training options available, highlights of the OSHA Rule, and some additional suggestions for your safety program.

The most significant changes in the OSHA ruling involve the training content and methods. OSHA requires the training to be a combination of formal instruction and practical training which emphasizes the specific types of trucks and the specific operating environment the employee will be working in. And, that after the training is complete the employer must evaluate the the trainee's knowledge and skills and determine that the employee is competent to operate the truck safely. OSHA leaves the specific method of **formal instruction** open. The consensus of the industry is that the formal training should be some type of classroom training consisting of comprehensive training manuals supplied to the trainees along with verbal instruction detailing the content of the training materials. Videos, slide shows, and overhead transparencies may be used to add redundancy to the training materials. Expect the formal classroom training to last at least 3 hours, make sure you allow time for discussions. While the method for formal training is flexible under the OSHA ruling, the content is not. OSHA is very specific on topics which must be covered, again I refer you back to the OSHA reference materials.

Practical training may prove to be more difficult for employers, especially if you are training first time operators. The ruling states that practical training be conducted "under the direct supervision of persons who have the knowledge, training, and experience to train operators and evaluate their competence; and where such operation does not endanger the trainee or other employees". Which means that until an operator has been evaluated and determined to be competent to operate the truck safely, that employee can only operate the truck under the "direct supervision" of the trainer. With experienced operators this should not pose a problem since the practical training and evaluation will generally go quickly, however, inexperienced operators may require a significant amount of time under the direct supervision of the trainer before they are determined to be "competent". If you have an operation which uses several different types of vehicles and/or has varied driver responsibilities, you may find it more effective to train and authorize the operator on only one vehicle and for only specific tasks initially, giving the operator time to acclimate prior to moving on. An example would be to only authorize an operator on the sit-down forklift moving and stacking product in a bulk storage area. After the operator has gained sufficient experience in this area you can then train and authorize the employee to work in a racked area, on the dock loading and unloading trailers, or on other types of vehicles.

The method of **operator evaluation** is also left open by OSHA. The industry standard is generally a written test and a performance test on the specific vehicles the operator will be operating. Creating an **effective written test** requires a balance between getting enough procedural and technical questions to ensure the employees knowledge, while remaining within the level of literacy of your operators. Operators may have difficulty with the written test even though they know the material due to language issues as well as literacy levels. Giving the written test verbally will often resolve these issues. OSHA does not dictate that a written test is given nor do they dictate a specific Pass level, however, I believe that a written test is the best means to ensure an operators knowledge of the course content. Historically these written tests have been very simple in order to avoid the situation created when operators FAIL. I suggest making the tests comprehensive (within reason) and plan retraining and retesting of those who may fail. The retraining would simply be going over the questions answered incorrectly until you are sure the operator now understands, and then retesting. Remember, the purpose is to ensure the operators have the knowledge; a comprehensive test with a plan for supplemental training and testing will prove to be more effective than the standard "you have to be an idiot to fail this" test. Also note that "comprehensive" doesn't have to mean "difficult." The test should be fairly easy to pass, it just shouldn't be a "no-brainer."

The **performance test** should require the operator to demonstrate knowledge of all controls and safety equipment on the vehicle as well as demonstrate the actual tasks in the workplace the operator will be required to perform. If the operator will be placing pallets in pallet racking, loading trailers, and hand stacking product with a man up truck, the operator should be tested in all of these operations. The operator should be tested on each piece of equipment he/she will be using. If your operators sometimes use attachments on the truck they should be instructed and tested on their proper use as well.

Training Options.

There are many **training options** available and it is important to investigate each option to ensure that your operators are getting a comprehensive training program.

Prepackaged training kits. It is impossible for a prepackaged training program alone to provide all of the information necessary for your operation. Remember you must train on the specific equipment and operating conditions of your operation. Prepackaged kits usually contain training booklets, test materials, videos, transparencies, or computer software. The prepackaged kit can prove to be an effective component of an in-house training program if supplemented with site-specific, equipment-specific training materials and conducted by persons with the knowledge and skills to conduct the training. Check my [Links page](#) for vendors of safety training materials.

Outsourced training. Outsourced training has become very popular with companies. Outsourced training has the advantage of a trainer who is usually more knowledgeable in lift truck safety and operation than anyone you may have in house. The problems with outsourced training is that they are usually a generic training program and will not be addressing the specific hazards of your operation. If the training occurs off site with a group of operators from different companies it will be impossible for the trainer to be giving enough site specific and equipment specific training to meet each companies requirements. If you use off-site training you should supplement it with site-specific, equipment-specific training in house. If you use outsourced training which conducts the training in house make sure the trainer reviews your operation and incorporates your operational issues into the training program. Another problem with outsourced training is that companies mistakenly feel that since they outsourced the training that they now have safe operators, and very little is done in-house to ensure that the operators are performing as trained. Outsourced training is usually available from your lift truck equipment dealer as well as consultants.

In-house training. In-house training is likely the best way to ensure that site-specific hazards are being

adequately addressed. If you have resources in house with the knowledge and skill to provide this training, this is probably the option for you. If you do not have personnel in house with this knowledge you will have to outsource the training. Many outsourced training programs also provide "train the trainer" courses which help to prepare in-house personnel to conduct the training. The OSHA supplied materials are very helpful (and free) in putting together your in-house training program. You may also want to incorporate some of the prepackaged training materials and use training materials from the manufacturer of the vehicle.

Additional Comments

Any safety program must start with an evaluation of the types of equipment and operation in which the equipment will be used. Site-specific hazards should be identified including, inclines, overhead obstructions, uneven or slippery surfaces, blind corners, etc. This evaluation provides a good opportunity to look for ways to eliminate hazards rather than training operators to deal with them. Document all equipment which will be used by the operators, this includes lift trucks, dock levelers, attachments, charging and battery changing equipment. Most equipment will have safety information provided with the equipment, if you do not have this information contact the dealer or manufacturer to obtain it. This information should be incorporated into your training materials.

Follow-up supervision is often a neglected part of lift truck safety programs. Operators frequently pass the safety training and immediately start operating a lift truck in an unsafe manner. It is imperative that you have supervisors that have gone through the safety training (even if they will not be operating the trucks) to ensure that they have the knowledge to enforce the safe operation of the equipment. It must be made clear to the supervisors that they are responsible for ensuring that operators are operating in a safe manner. Any observed violation of safety procedures must be addressed immediately, failure to do this will guarantee an unsafe operation. Would you feel safe driving in your car if there was no enforcement of traffic laws? If you've ever driven in a city in a third-world country you would know what it's like. Remember that training and testing ensures the operators know how to operate safely but proper supervision will ensure that they **do what they know**. I firmly believe that follow-up supervision after the training program is as important — if not more important — than the safety training itself.

OSHA requires **refresher training** if an operator is observed driving in an unsafe manner, has been involved in an accident or near-miss, or if different equipment or hazards are introduced to the workplace. OSHA also requires that operator's performance be evaluated every three years. OSHA does not require that the operator goes through the entire training program every three years, only that their performance be evaluated. I would suggest that they you do conduct the entire course at least every three years anyway. OSHA also allows you to accept previous training an operator has had with a previous employer provided it meets the requirements of your training program. Since the content of the previous training is almost impossible to determine I recommend sending all new employees, regardless of previous training, through the complete training program.

Dock Safety is often overlooked or underemphasized in training programs. In my opinion, the loading dock is usually the most dangerous area of a warehouse for lift truck operators as well as non operators. Training should include proper use of dock levelers, truck restraining devices, trailer inspection, and any additional signaling or safety devices used. See article on [Dock Safety](#).

Limit the use of vehicles and the area in which they can operate. If someone will not be using a piece of equipment regularly, do not authorize them to use it. Try to refrain from "I want them to be authorized just in case". Taking someone who does not drive a lift truck on a regular basis and allowing them to hop on the truck once or twice a year is an accident waiting to happen. If you have people you need as backup, try to schedule them to get some time on the vehicle periodically to keep their skills up. I am not against training these people in lift truck safety, in fact having non-operators who work in warehouse and dock areas in the classroom training is a great idea, I just think it is dangerous to have inexperienced operators. Do not underestimate how much an operators level of experience affects safety. Also, I suggest not allowing lift trucks to operate where they are not needed. A lift truck is not a means of transportation, they should not be driven to the lunch room or telephone. A man-up order selector has no reason to be driving in a dock area, and a sit down forklift used to load trucks likely has no reason to be driving through your narrow aisle racking areas. Allowing lift trucks to be driven where they are not used adds nothing to the productivity of your operation and creates potential for accidents.

Make sure operators use all **safety equipment** provided with the vehicle including seat belts for sit down vehicles and safety belts and tethers for man-up vehicles. It has been shown that many fatalities resulting from tipovers or forklifts falling from docks are the result of the operator falling from or trying to jump from the vehicle only to be crushed by the operator cage. A seat belt and other operator restraining devices will keep the operator within the cage. I'll again emphasize supervision in that it is unlikely that your operators will regularly use their seat belt unless they are forced to (although having them read OSHA's report on selected forklift fatalities may convert them).

There are also physical issues which will affect safety within your facility. Having frequent preventative maintenance to lift trucks, dock levelers, and other equipment as well as making sure aisles and traffic lanes remain uncluttered and well marked will increase your level of safety. Install physical barriers near edges of docks or other hazardous areas to protect operators and pedestrians.

I hope this articles helps you to initiate or enhance your lift truck safety initiative. I am a little surprised as to how many times I've made reference to OSHA requirements within this article as my intention was not to write an article on OSHA compliance, but rather an article on lift truck safety with some reference to the new ruling. The fact is that OSHA did such a fantastic job in the new ruling and the information and training materials they are providing that I will once again encourage anyone involved in the operation of lift trucks to read these materials. If you haven't already been to the OSHA site **GO THERE NOW!**



A Note on Impact Alarms.

Impact alarms are devices that can be attached to lift trucks that sense impacts; they have been around for years and are available from several manufacturers. Companies often purchase impact alarms after they have achieved a certain level of aggravation brought on by unreported lift truck damage to racks, inventory, or other equipment. The concept being that when a lift truck driver hits a rack, an alarm will sound thus notifying his supervisor (and everyone else) of the incident (and guilty party). The reality is that these devices are frequently purchased, installed, then promptly turned off. The problem is that lift trucks take a lot of jolts that are not collisions. Driving over dock levelers, cracks in floors, or debris on floors constantly set off these alarms (requiring the supervisor to then come running to turn it off). While you can adjust the sensitivity of these devices, by the time you have tuned the sensitivity to a point where it is not going off when you don't want it to, it probably is not going to go off when you do want it to (it does not take much of an impact to bend pallet racking).

For years I've advised against installing these devices in most facilities because of these problems. However, there have been some technological advances in recent years that are starting to show some promise in solving these issues. In one case, a company integrated location tracking through a Wi-Fi network that then logged the time and location of the impacts into a computer (no alarm). Then, if you find damage in the warehouse, you can review the logs to see if an impact was logged in that physical location. While this doesn't really solve the problem of false positives, it does provide a workable compromise. Obviously this is going to be more costly than the simple standalone impact device mounted to the truck.

Update: Seatbelt Use

There has recently been debate within OSHA related to enforcement of seatbelt use. This is probably due to complaints by operators and businesses. It seems as though OSHA is trying to relax the policy and only require seat belts under certain operating conditions (such as only with specific tasks in specific areas of the plant). The problem with this logic is, that if workers are not required to wear the safety belts all the time, they will very likely not wear them when they are needed (either intentionally or because they "forgot"). I'll admit that I didn't think much of safety belt use until I read the specifics of lift truck fatalities. After reading these, I was convinced that seatbelts should be required.

Further Reading:

Warehouse Safety: A Practical Guide to Preventing Warehouse Incidents and Injuries. I just can't say enough good things about this book. Highly comprehensive in dealing with a broad range of safety issues within a warehouse environment, *Warehouse Safety* is an excellent source for information on safe operating procedures. **Available at Amazon . Read full review at The Inventoryops Book Shelf**

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Loading Dock Safety: Education and Equipment can increase safety in your loading dock.

By Dave Piasecki

It is easy to come to the conclusion that the loading dock area is very likely to be the most hazardous part of your operation when you consider the combinations of hazards and the volume of activities that occur in this area. For the lift truck operator, ramps and inclines, overhead obstructions, dissimilar surfaces often wet and slippery, poor lighting in trailers, other vehicular traffic, pedestrian traffic, restricted views, sheer drops, trailer creep, congested staging areas, and accumulations of empty containers, pallets, and debris are hazards which can all be present at the same time within a very confined area. While OSHA does require training of lift truck operators on these types of hazards, many operations fail in providing detailed hazard assessment, operational procedures, and day-to-day enforcement of safety issues. In addition, those employees that do not operate lift trucks are rarely trained on dock safety issues even though they share many of the same risks as the lift truck operators.

The biggest reason to put a priority on dock safety is not so much related to the frequency of accidents in dock areas as it is to the potential severity of injuries that can occur in these types of accidents. Injuries sustained when lift trucks tip over or fall from docks, or those that occur when pedestrians are impacted by a lift truck, falling load, or tractor-trailer, tend to be very serious and sometimes fatal. Prevention of these types of accidents can be achieved through proper equipment, proper training, and enforcement of safe operating procedures.

Wheel Chocks

When people think of dock safety the first thing that will generally come to mind is the wheel chock. Wheel chocks are wedge-shaped blocks placed in front of the rear wheels of a trailer to prevent the trailer from moving away from the dock while the trailer is being loaded. Trailer creep (also known as trailer walk, dock walk) occurs when the lateral and vertical forces exerted each time a lift truck enters and exits the trailer cause the trailer to slowly move away from the dock resulting in separation from the dock leveler. Factors that affect trailer creep are the weight and speed of the lift truck and load, the grade of the drive the trailer is parked on, the softness of the suspension, the type of transition (dock levelers, dock boards) being used, and whether the trailer has been dropped off (spotted) or if it is still connected to the tractor. Separation from the dock also occurs when a driver prematurely pulls away while the truck is still being loaded/unloaded.

OSHA regulations require the use of wheel chocks or other vehicle-restraining device when loading and unloading trucks and trailers. The effectiveness of wheel chocks is an often hotly debated issue. Depending on the surface conditions and type of chock being used chocks can sometimes slip thus reducing their effectiveness in preventing trailer movement. Also, requiring people to walk in between trailers to set and remove the wheel chocks creates additional safety issues. A bigger problem with wheel chocks is, however, not so much related to their physical characteristics as it is to the difficulty in enforcing their use. Often, companies feel that by chaining wheel chocks to the outside of their dock and putting up a couple of signs reminding the drivers to use them they have done their part in dock safety. In reality this approach will provide minimal if any usage of the chocks. If you're going to use wheel chocks you must require your lift truck operators to verify the chocks are in place, and be prepared to frequently verify that your operators are doing this. You should also make sure your operators have an easy way of verifying the chocks are in place. Many dock designs do not provide visibility to the trailer wheels from inside the building. Windows, mirrors and cameras can resolve this. Enforcement of this type of a policy is critical; if you do not regularly confirm compliance and discipline non-compliance, the chocks will simply not be used. You also need to keep spare chocks on hand as chocks are often casualties of theft and snowplowing operations.

Other Vehicle Restraint Devices.

There are a great variety of alternative vehicle restraint systems available and their popularity is growing. Of these, one of the most popular is the ICC bar type restraint system. These systems incorporated a device that engages the ICC bar (rear impact guard) on the rear of the trailer preventing it from moving away from the dock. These devices may be mechanically or hydraulically operated and may vary significantly in design and functionality from one manufacturer to another. There are also other types of restraints such as those that automatically engage the rear wheels of the trailer. As with the ICC bar restraints, the wheel engagement restraints also vary significantly from one manufacturer to another. There is not a one system fits all solution for vehicle restraints. ICC bar systems may not work with damaged ICC bars, lift gates, and low-boy trailers. Wheel engagement systems are more expensive and may have problems in northern climates due to snow or ice.

Dock Levelers

It's also important to note the importance of the dock leveler in dock safety. Dock levelers provide a bridge to the trailer as well as a ramp to facilitate the transition in height from dock to trailer. Dock levelers are rated by weight capacity and by the service range. The service range also known as the height differential rates the safe range above and below dock level you can use the leveler to transition to the trailer height. Differences in trailer width, height, floor level and the recent popularity of air-ride suspensions are forcing more attention on the functionality of dock levelers and their ability to safely handle the variety of vehicles serviced.

Dock levelers come in mechanical and hydraulic models. The mechanical models require the operator to pull a chain and then walk down on the leveler to engage it, while hydraulic models provide automatic functionality from push buttons usually mounted on the wall next to the dock door. Hydraulic models also offer a smoother transition when entering vehicles with soft suspensions (such as air-ride). Mechanical levelers use a mechanical safety mechanism to prevent the dock from bottoming out if it disengages from the trailer floor, the side-effect of this safety mechanism is that when you enter a trailer with a soft suspension the main portion of the leveler will not always drop with the suspension, leaving only the hinged lip to make up for the height differential. Hydraulic levelers incorporate a hydraulic velocity fuse as a safety mechanism, this still allows for full functionality of the leveler as the trailer height changes.

The advantages in using automatic dock equipment with electronic controls include the ability to incorporate all of the equipment into signaling devices. Signaling devices such as signal lights will let your lift truck operators know that the restraint mechanism and the dock leveler are properly engaged signaling that it is now safe to enter the trailer, while at the same time signaling the truck driver that it is unsafe to pull away from the dock.

Additional Equipment

Other dock equipment includes stand-alone barriers and barriers built into dock levelers to prevent driving off the edge of the dock when the dock is empty, fixed and variable height ramps to raise trailers to a level closer to that of the dock, and a variety of dock doors and dock seals. It's very important to use the operating instructions provided by the manufacturer of dock equipment as operating procedures will vary based upon the type of equipment used. Some hydraulic dock levelers may allow you to leave the leveler engaged as the trailer departs while most mechanical levelers should be fully disengaged and returned the stored position prior to trailers departing.

Additional Recommendations

The following are additional recommendations that can improve safety in your dock operation. Some of these are equipment related while most are simply procedural.

- ◆ Use portable jack stands in addition to the forward landing gear of spotted trailers when loading and unloading to prevent potential tipping. Also note that spotted trailers (dropped trailers) are more susceptible to trailer creep.
- ◆ Make sure lift trucks used to load/unload trailers are equipped with spotlights, also use dock mounted lights to supplement the lift truck lights or when manually loading/unloading trailers.
- ◆ I highly recommend side shifts as standard equipment of forklifts. Not only do they increase productivity, but they also help to prevent product damage and promote safety by allowing the lift truck operator to perform the task with fewer movements and eliminates the need to ride right against the wall of a trailer.
- ◆ Have all equipment maintained in accordance with manufacture's recommendations. This includes lift trucks, dock levelers, vehicle restraining devices, dock doors and seals, and automatic signaling devices.
- ◆ Do not allow pedestrians in trailers while a lift truck is loading/unloading. The likelihood of being crushed by a forklift is greater in tight spaces.
- ◆ Perform a visual inspection of the trailer prior to driving a lift truck into it. Damaged and rotting floorboards are common in older trailers and even though I have never heard of a lift truck completely falling through the bottom of a trailer, a wheel breaking through is fairly common. Also be aware that the lift truck wheel breaking through the trailer floor will probably not be as dangerous as the execution of the ingenious plan your warehouse personnel will devise to try to get the lift truck unstuck.
- ◆ Caution is advised when using lift trucks to unload straight trucks (small delivery trucks). Make sure the straight truck has the capacity to handle the weight of the lift truck and loads. I generally recommend using hand pallet jacks rather than lift trucks to unload straight trucks whenever feasible.
- ◆ Use physical barriers at open edges of docks and ramps and to protect pedestrian walkways.
- ◆ Use paint or tape to designate staging areas, through aisles, and loading lanes. Make sure employees recognize the designations.
- ◆ Keep the dock areas clean and free of debris. Now I'm not one to tell you that the floor should always be spotless and that employees should immediately pick up every little scrap of paper that may appear. Loading areas should be completely swept at least once per day or once per shift, large pieces of debris such as broken pieces of pallets

should be picked up immediately.

- ◆ Designate areas for storage of used pallets, containers, and trash. Also limit the stacked height of used pallets and containers.
- ◆ Limit the stacked height of materials in staging areas, especially if pedestrians will be working around the material. Also leave sufficient access aisles between rows of staged material if employees may be required to inspect or otherwise access the material.
- ◆ Use traffic cones or portable barricades to temporarily block off staging lanes where pedestrians are working.
- ◆ Special attention should be given when large loads are being handled that may obstruct the view of the lift truck operators. While normally a lift truck operator would be driving in reverse with these loads, this option is not available when loading trucks. Both lift truck operators and pedestrians working in the loading area must be aware of this.
- ◆ If you require your employees to install or remove security seals for truckloads and containers you should designate a safe area away from the dock to do this. Never allow an employee to stand between a trailer and the dock.
- ◆ When loading small vans such as those used by small parcel carriers I highly recommended doing this at a street level dock or a specially designed ramped dock (you can also add ramps to existing raised docks). If you must use standard raised docks, you may want to consider temporarily or permanently blocking off adjacent docks to eliminate risk from trailers backing into areas where people are working. Also, use the dock closest to the building access and use chocks behind the van's wheels to prevent the van from rolling back potentially crushing someone between the van and the dock.
- ◆ Instruct employees not to climb on docks or to place any part of their bodies outside of the dock door. I recently read a story about a local warehouse worker who was crushed between a trailer and the dock seal. Apparently he was hanging out of the dock probably trying to signal a driver or get a view of another dock when the trailer backed up.
- ◆ If employees need to climb down into the dock area make sure proper ladders or stairs are provided.
- ◆ Train all employees that work in dock areas on the hazards. Do not make the mistake of limiting training to lift truck operators only.
- ◆ Enforce compliance to all procedures. Plant safety is directly related to the enforcement of safety procedures. If you don't enforce it, it won't happen.

Also read my article on [Lift Truck Safety](#) and see the [Dock Equipment Pics](#) page.

Further Reading:

Warehouse Safety: A Practical Guide to Preventing Warehouse Incidents and Injuries. I just can't say enough good things about this book. Highly comprehensive in dealing with a broad range of safety issues within a warehouse environment, *Warehouse Safety* is an excellent source for information on safe operating procedures. **Available at [Amazon](#) or [The Government Institutes](#). Read full review at [The Inventoryops Book Shelf](#)**

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Lift Gate Safety-Precautions and Protocols

I Lift Gate Loss History and Objectives

- A Lost time incidents caused by:
 - 1 Unsafe conditions: problems with lift.
 - 2 Employee behaviors: improper operation.

II Objectives

- A Understand the safe operations to opening platform, operating lift gate (up/down), and storage of platform for transit.
- B Inspection and maintenance.
- C Lift gate activity.

III Safe Operation of Lift Gate

- A Open platform:
 - 1 Ensure area behind and around platform is clear prior to and during operation.
 - 2 Remove latch chain from platform.
 - 3 Use lowering switch to open platform.
 - 4 Allow closer handle and cam assembly to rotate upwards before raising platform.
- B Operate lift gate:
 - 1 RAISE switch-raises platform.
 - 2 DOWN switch-lowers.
 - 3 Use either hand control or vehicle control.
 - 4 Speed can be adjusted at the adjustable flow control valve located in the hydraulic enclosure. See operators manual.
 - 5 Maximum rated capacity is based on loads evenly distributed on a flat platform.
 - 6 Platform is to be placed either flat on ground or flush with truck bed. No intermediate height (i.e. step).
- C Personnel movement:
 - 1 Grab hand control, place feet firmly on platform away from edges.
 - 2 Operate hand control for desired ascent or descent.
 - 3 Wait for platform to come to rest before dismounting.
- D Storage of platform for transit:
 - 1 Ensure platform is clear of all objects.
 - 2 Lower platform halfway to ground, this allows cam assembly to be rotated to horizontal position.

Lift Gate Safety-Precautions and Protocols

- 3 Using the closer handle, rotate and hold the cam assembly in the less than horizontal position (i.e. the closer handle will be aimed downward) and use the RAISE switch (via hand control or vehicle mounted control) to raise the platform to transit or:

- 4 If platform is already on the ground, hold the closer handle in down position (i.e. less than horizontal and use RAISE control to enable platform to be raised to transit position.
- 5 Connect chain and S-hook to platform.

IV Maintenance and Inspection

A Monthly inspection and maintenance:

- 1 Prior to operation check for cracked welds, bent or distorted members, lift arms or hydraulic cylinders.
- 2 Check that pivot and cylinder pins are in place and secure.
- 3 Ensure controls are operating effectively.
- 4 Ensure platform when raised comes flush with truck bed.
- 5 Inspect that cam assembly and closer handler are operating and undamaged.

REPORT ANY DAMAGES OR DEFICIENCIES TO YOUR FOREMAN AND DO NOT USE LIFT!!!!

B Semi-annual inspection:

- 1 Conducted by qualified personnel based on operator's manual.

C Do's and Don'ts-See Attachment.

Lift Gate Safety-Precautions and Protocols

Reference:

Waltco Truck Equipment Co.: Waltco Lift Gate Safety Training.

IMPORTANT

TO BE KEPT IN VEHICLE

CAUTION:
STAND CLEAR AND KEEP CLEAR OF PLATFORM
AREA WHILE OPERATING LIFTGATE.

**FOR OPERATION OF THIS UNIT, REFER TO THE "OPERATION INSTRUCTIONS" INSIDE
OF THE OWNER'S MANUAL AND THE OPERATION INSTRUCTIONS DECAL.**

LUBRICATION INSTRUCTIONS

Refer to the lubrication chart in this manual.

DO'S AND DON'TS

- DO: Make certain area in which the platform will open and close is clear before opening or closing platform.**
- DO: Make certain platform is properly latched when in transit.**
- DO: Make certain platform area, including the area in which loads may fall from platform, is clear before and at all times during operation of the lift gate.**
- DO: Operate the lift gate with the control switches only.**
- DO: Check oil level monthly and change oil yearly.**
- DO: Use hydraulic fluids listed on the HYDRAULIC FLUID CHART (found inside this manual) or equivalent.**
- DO: Lubricate as per the LUBRICATION INSTRUCTIONS and LUBRICATION SCHEDULE found in this book.**
- DO: Read and follow WARNING DECALS, OPERATION DECALS and OWNER'S MANUAL.**
- DO: Visually inspect the lift gate frequently and keep it in adjustment.**
- DO: Be certain vehicle is properly and securely braked before using the lift gate.**
- DO: Repair the lift gate when it is found to be faulty to prevent accidents.**
- DO: Keep all decals in place and legible and retain the Owner's Manual in the vehicle or ALL WARRANTIES ARE VOID.**

- DON'T: Allow the lift gate to be used by persons not familiar with its operation.**
- DON'T: Use the lift gate if unit shows signs of abuse or fails to operate freely.**
- DON'T: Permit the motor to run after the lift gate is raised to bed level.**
- DON'T: Overload the lift gate. (Refer to the capacity chart for proper capacity of lift gate.)**
- DON'T: Use brake fluid.**

